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14. ABSTRACT
Final Report. Capabilities of LEEDS® were to be extended based upon the requirements collected for the E-CRAFT program. Requirements analysis will consider the following aspects of the E-CRAFT life cycle: ship design, construction, operation, maintenance, and recapitalization. Progress toward the development of LEEDS support tool enhancements was limited to the architectural design of a context-based diagnostic capability. A new version of the LEEDS web portal for E-Craft was successfully developed and deployed, with security enhancements, using preliminary ship work breakdown structure (SWBS) data. Further work is continuing under contract N00014-07-M-0127.

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SMS Systems Modernization and Sustainment Center
ROCHESTER INSTITUTE OF TECHNOLOGY

LEEDS Decision Tools for E-Craft

Final Report

period

February 15, 2007 through February 15, 2011

Prepared for:

Office of Naval Research
Award No. N00014-07-M-0121

February 15, 2011

Systems Modernization and Sustainment Center
Rochester Institute of Technology
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SUMMARY

The initial project plan called for a phase of application discovery to identify key areas of opportunity for decision tool development that would meet the needs of MSB. Stakeholder interviews were to be conducted to generate user requirements, which would serve as the basis for formulating the LEEDS software functional specification.

Following the discovery phase, algorithms and business logic were to be developed to meet the objectives of the functional specification. Information design and user report specifications were then be used to define software tool interaction methods.

Software development was planned to commence after acceptance of a prototyped software demonstration. Deployment of the new tools within LEEDS would be deemed complete after system testing. Final demonstration of the decision support tools was to be given for a selected ship system.

Delays in ship construction, the unavailability of ship design data, and inability for stakeholders to define operations and maintenance requirements halted development efforts for decision support enhancements to LEEDS. As a result, user requirements were not gathered, preventing their translation into a functional specification. The lack of user requirements and a functional specification prevented the fulfillment of the project objectives.

Progress toward the development of LEEDS support tool enhancements was limited to the architectural design of a context-based diagnostic capability. A new version of the LEEDS web portal for E-Craft was successfully developed and deployed, with security enhancements, using preliminary ship work breakdown structure (SWBS) data.

Several concepts were also presented to MSB suggesting alternative LEEDS enhancements. A concept for configuration management within LEEDS based on the EIA-836 standard was rejected by MSB in favor of commercial fleet management software. Additional concepts were presented for performing predictive analysis using data from key ship systems and correlating operational characteristics of the data to maintenance records. RIT has received no feedback regarding which system monitoring would be most beneficial to MSB.

TASKS

1. **Decision support research**
   - *Data/analysis needs for ship design and construction activities will be investigated. A user-centered design approach will entail interviews to assist needs identification. A formal user requirements document will summarize the findings.*
   - *Data/analysis needs for ship operation and recapitalization activities will be investigated. A user-centered design approach will entail interviews to assist*

needs identification. A formal user requirements document will summarize the findings.
- *User requirements will be translated into functional specifications to guide algorithm and software development. Priorities for the development of software functionality will be established with input from ONR.*

The initial project plan called for a phase of application discovery to identify key areas of opportunity for decision tool development that would meet the needs of MSB. Stakeholder interviews were to be conducted to generate user requirements, which would serve as the basis for formulating the LEEDS software functional specification.

Early in the project, a Project Initiation Document (PID) was written by RIT and submitted to MSB for its approval. This document is attached in Appendix A. It completely described the project expectations and included the following:

a. project objectives
b. project deliverables
c. responsibilities of RIT and MSB
d. communication plan
e. project assumptions
f. project plan
g. project risks

As outlined in the PID, MSB was responsible for identifying and recruiting an appropriate user group for requirements gathering, and was also responsible for identifying an appropriate subset of functionality that would drive the development of new decisions tools within LEEDS. User requirements were never gathered and the LEEDS functionality desired by MSB was never identified.

A ship construction project plan, to be used to create and adjust the LEEDS project plan, was requested but was not received.

2. Methods and algorithm development

- *Quantitative/qualitative algorithms will be developed and refined for equipment assessments and analysis.*
- *Methods of user interaction will be investigated and defined to improve data-mining capabilities and tool usability.*

Following the discovery phase, necessary algorithms and business logic were to be developed to meet the objectives of the functional specification. Information design and user report specifications would then be used to define software tool interaction methods. The lack of user requirements and a functional specification prevented any algorithm development.

During the application discovery phase of the project, RIT identified several areas of opportunity for LEEDS support tool enhancements and presented these to MSB for consideration. These opportunities included:

a. operational monitoring
b. health monitoring
c. condition-based maintenance (CBM)
d. health driven scheduling
e. reliability, availability, maintainability strategies
f. reliability centered maintenance (RCM)

MSB expressed interest but provided no useful feedback regarding which tools would be of most benefit to them in an enhanced LEEDS product.

It was the intent of RIT to conduct interviews with stakeholders from MSB to identify enhancements to LEEDS that would best serve MSB in its life-cycle management of the ship. In the absence of direct input from the stakeholders, it was the opinion of RIT that MSB would need assistance in the areas of Reliability Centered Maintenance and Economic Decision Support.

A survey of RIT's existing RCM software tool was conducted to determine how to best incorporate RCM into the FMEA process already a part of LEEDS. Plans were made to enhance the economic/cost analysis algorithms already utilized in LEEDS to provide meaningful evaluation methods for guiding equipment investment decisions. These plans were summarized in an Application Discovery document that was presented to MSB for stakeholder buy-in. This document is attached in Appendix A.

In a further attempt to foster the development of support tool enhancements, an architectural design of a context-based diagnostic capability as created by RIT and presented to MSB. RIT received no useful feedback on this design, depicted in Figure 1.

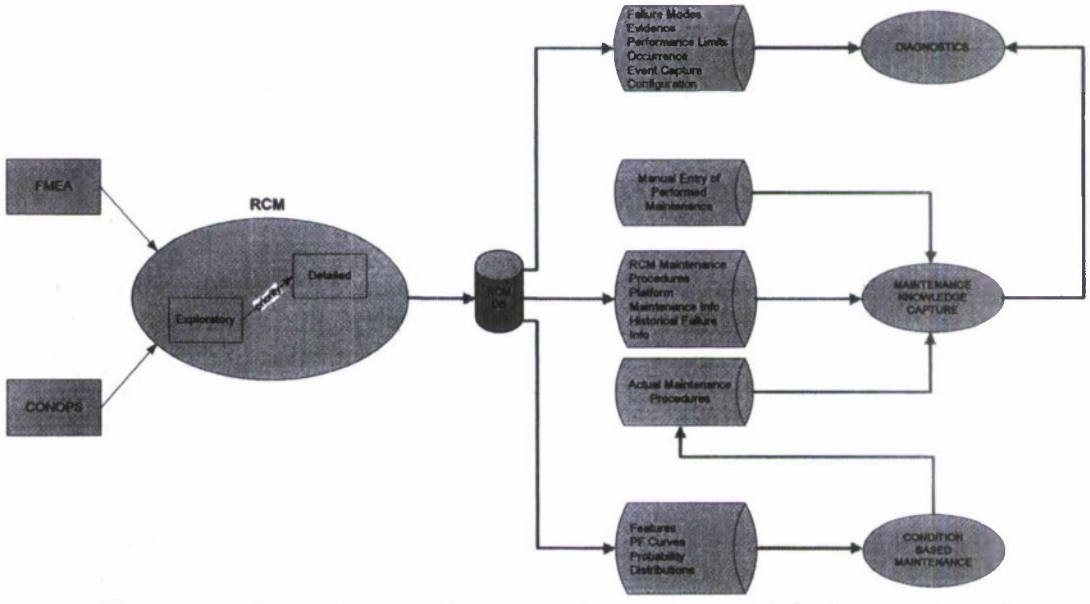

Figure 1 - Information Architecture of a Context-based Diagnostic Tool

3. Software tools development

- *User interface prototypes will be developed based upon developed methods and algorithms. User testing and resulting feedback will be used to refine design.*
- *Development of software tools will occur, guided by prioritized functional specification*
- *Software tool enhancements will be implemented and tested within populated E-Craft LEEDS® portal to demonstrate intended function.*

Software development was planned to commence after acceptance of a prototyped software demonstration. Deployment of the new tools within LEEDS would be deemed complete after system testing. Final demonstration of the decision support tools was to be given for a selected ship system.

One of the project objectives was the creation of a LEEDS E-Craft web portal. Such a portal was successfully developed, with security enhancements, and its database was populated with data from a preliminary ship work breakdown structure (SWBS), see Figures 2 and 3. This website and database was hosted on a web server at RIT. It was the intent of RIT to use this as the starting point for tool enhancements based on interviews with stakeholders.

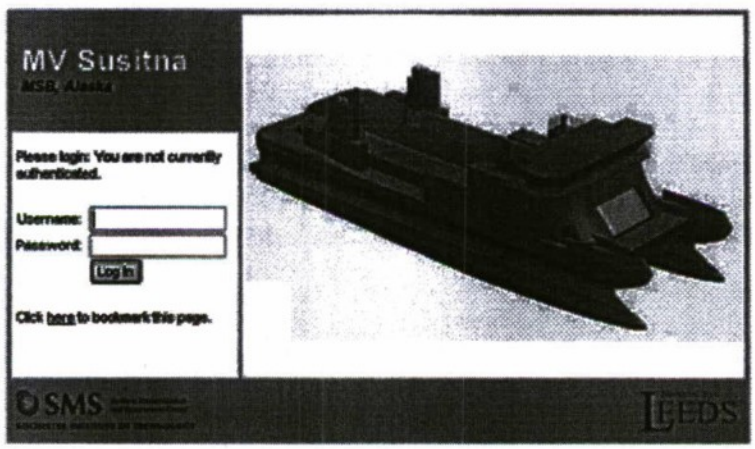

Figure 2 - LEEDS E-Craft Login Screen

This website was developed and its database populated using a preliminary ship work breakdown structure (SWBS). The SWBS allowed only the platform hierarchy (system tree) to be populated. RIT was unable to carry out further population of the database due to the unavailability of ship documents (drawings, manuals, maintenance procedures, etc). RIT has not received a SWBS document since the preliminary copy received in October 2006.

Detailed instructions on the administration and usage of LEEDS E-Craft were provided. These documents are included in Appendix A.

- Guidelines on getting started

- Instructions to users requesting access to LEEDS
- Steps for creating a new LEEDS user
- Instructions for adding data via the LEEDS portal
- System requirements for hosting LEEDS
- LEEDS portal security features

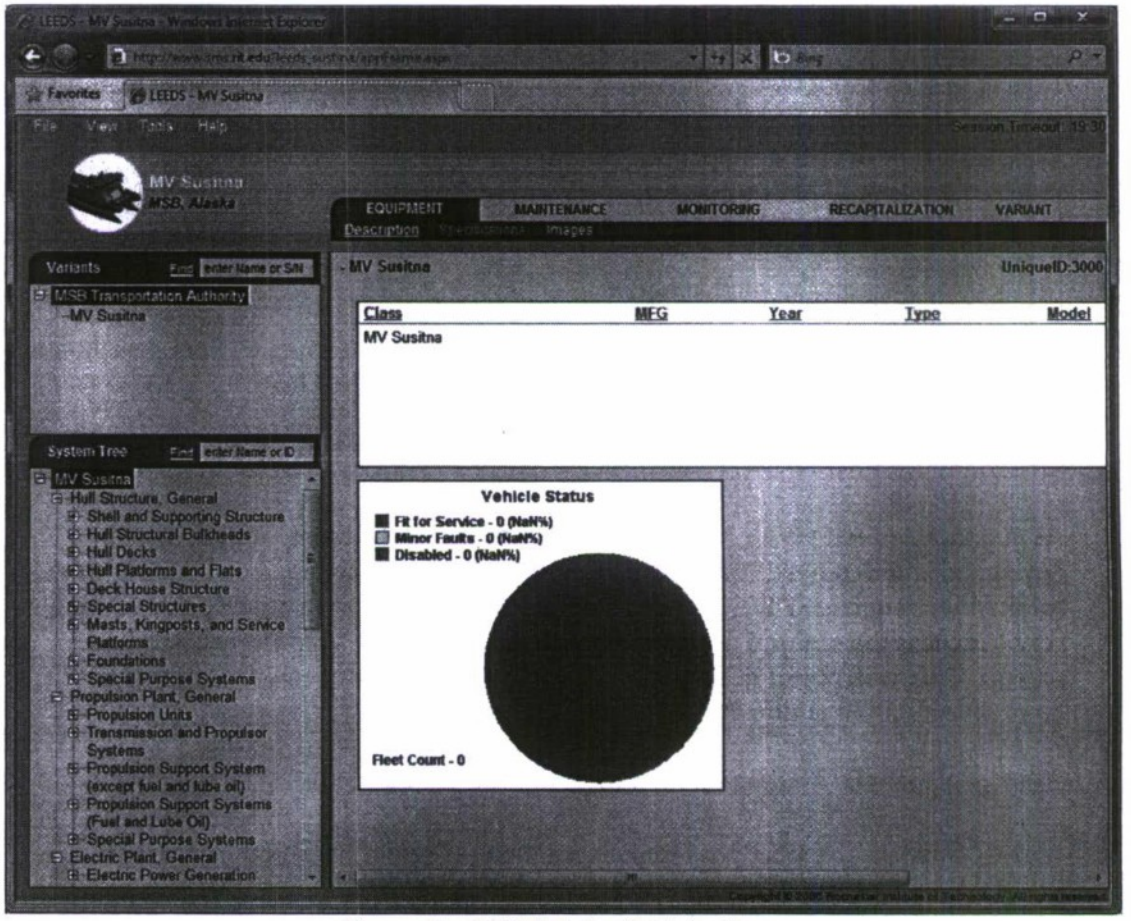

Figure 3 - LEEDS E-Craft Main Page

Due to delays in the ship construction schedule, work on this contract was placed on indefinite hold in October 2008.

In May 2009 an attempt was made to re-engage with MSB by presenting a new LEEDS design concept for ship/equipment configuration management and health monitoring of key ship system(s), with an emphasis on configuration management adhering to the EIA-836 standard. However, MSB stated their decision to use Fleet Management software from the American Bureau of Shipping (ABS) instead of LEEDS.

In November 2009, RIT presented a preliminary concept for performing predictive analysis using data from a key ship system and correlating operational characteristics of the data to maintenance records. Based on feedback received from MSB, RIT presented a

second concept in December 2009 in which several candidate systems for monitoring were presented. To date, RIT has received no further feedback from MSB. The concept document presented in December 2009 is included in Appendix A.

DELIVERABLES

1. Decision support research

   Delays in ship construction, the unavailability of ship design data, and the inability of stakeholders to define operations and maintenance requirements halted development efforts for new decision support enhancements to LEEDS. As a result, user requirements could not be gathered, preventing their translation into a functional specification.

2. Methods and algorithm development

   The lack of user requirements, a functional specification, and input from stakeholders prevented the development of new decision support and data analysis algorithms within LEEDS.

3. Software tools development

   As summarized above, a LEEDS E-Craft website and database was successfully developed and deployed, with security enhancements, using preliminary ship work breakdown structure (SWBS) data. Detailed instructions were provided describing how to access the site and populate the database with ship engineering data and articles. This web portal is hosted on an RIT web server and can be accessed at http://www.sms.rit.edu/leeds_sustina/secLogin.aspx .

Attached as Appendix A are the following supporting documents.

MV Susitna LEEDS Portal Implementation – Project Initiation Document
MV Susitna LEEDS Portal Implementation – Application Discovery
MV Susitna LEEDS Portal – Getting Started
MV Susitna LEEDS Portal – Requesting Access
MV Susitna LEEDS Portal – Portal Security
MV Susitna LEEDS Portal – System Requirements for LEEDS F Hosting
LEEDS Implementation for E-Craft – Concept for performing predictive analysis

Contract Number
N00014-07-M-0121
Dated 2/15/07 through 2/15/11

FISCAL STATUS AS OF February 15, 2011

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Final amount billed – item No. 000501 : $15,000

ROCHESTER INSTITUTE OF TECHNOLOGY

MV Susitna – LEEDS Portal Implementation

Project Initiation Document

Author: Jeff Heintz

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Version Control

Version	Date	Author	Comments
0.1	08 December 06	Jeff Heintz	First Draft
0.2	04 January 07	Jeff Heintz	Updated to include ONR contract deliverables
0.3	05 February 07	Mike Thurston	Updated to reflect LEEDS software sensitivity
0.4	06 February 07	Jeff Heintz	Updated deliverables reflecting group feedback from joint ONR-RIT discussion
0.5	26 March 07	Jeff Heintz	Accepted RIT changes, released to workgroup
0.6	09 July 07	Jeff Heintz	Added MSB personnel to workgroup listing

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Overview

The purpose of this document is to define the project expectations for the design, development and deployment of the MV Susitna LEEDS portal for the Matanuska-Susitna Borough (MSB) and Office of Naval Research (ONR). It forms the basis for the management of the project and the assessment of overall success. The funding for this project is supplied by ONR grant N00014-06-1-0998 and separate ONR contracts.

Project Definition

Project Objectives

- *Deploy a secure information portal to provide document management of engineering data and articles developed during ship design and construction activities, to be utilized over the Internet by distributed users; intended for use by MSB and its contractors to support operations and maintenance once ship has entered service.*
- *Provide direct support for the population of engineering data within the portal*
- *Research and develop new decision support or data logging/analysis capabilities that will be incorporated within LEEDS portal to assist MSB and ONR for ship operation, maintenance, or evaluation.*

Acceptance Criteria

The acceptance criteria define the goals that the project must meet in order to be accepted by MSB. These have been defined as the following:

- Users can engage in an interaction with the system as part of their work on selected tasks in the domain of ship life-cycle support using the LEEDS portal
- Ship data contained in the portal reflects as-built configuration
- Following quality assurance testing, there are no major bugs in the system
- The system provides the customer with a means of updating the ship data as new data becomes available, or as changes are made to the as-built configuration. User documentation should also support this capability.
- RIT-generated software and sufficient documentation/training is provided for MSB to install and run the application on a clone of the RIT system

Method of Approach

The method of approach will depend on the availability of data and the degree of proprietary information that must be segregated between originators of design artifacts.

Preferred Approach

The effectiveness of decision systems relies on the availability of good data. RIT will request the data necessary to serve as inputs to the decision support tools. It will be the responsibility of the client to supply data from the appropriate content providers. It is preferable that this content be provided in a digital format, however other formats are acceptable as RIT will reformat as necessary. Inclusion of confidential data in the database may also induce constraints in the project necessitating complex data compartmentalization requirements.

Alternative Approach

If data is not available in an all-digital format, RIT will attempt to digitize data employing scanning technologies or manual data entry. Such effort will reduce the capacity to customize tools for MSB/ONR use.

If sufficient data is not available (regardless of format) RIT will attempt to generate the missing data sets utilizing in-house engineering resources with input from the client. If the expected effort to complete the dataset for all ship systems falls outside the scope of this project, then effort will be expended to complete datasets only for those systems identified by the client to be critical. If overly-complex permissions will be necessary to compartmentalize confidential/proprietary data, then exclusion of that data from the portal will be considered. Any of these approaches will introduce risks and constraints in the project.

LEEDS Implementation Scope

In scope

- Providing an interaction for retrieving ship information from LEEDS portal
- Populating portal with data from content providers
- Developing new decision support tools customized to meet the needs of MSB and/or ONR; populated for selected systems based upon input from MSB/ONR
- Maintaining LEEDS portal throughout project: hardware/software upgrades, user profile management, user support, etc.

Out of scope

- Updating data populated within LEEDS portal after as-built technical data package release
- Populating data for all systems within newly developed decision tools
- Meeting the required hardware and software robustness for military deployment

MSB Responsibilities

- Provide the ship data necessary to populate portal
- Designate user permissions governing portal access; identify data considered to be confidential/proprietary
- Lead the identification and recruitment of an appropriate user-group for requirements gathering and any prototype testing
- Assist in identifying an appropriate subset of functionality for new decision tools; provide data for a select system to support tool demonstration
- Provide server-side hardware and software licenses in the event of deploying the server at MSB's premises
- Timely review and sign-off of deliverables

RIT Responsibilities

- Lead the portal population effort by receiving, formatting and populating data within the existing LEEDS application for all ship systems
- Capture the requirements for new decision support tools from a representative user group
- Research and identify an appropriate subset of new decision tool functionality, in collaboration with MSB/ONR, for implementation in the LEEDS application; implement new functionality for select ship systems
- Design and develop the algorithms and user interface in support of selected functionality within existing LEEDS application framework

- Provide training to the MSB on the portal's use and assist in deploying the application at their premises
- Host and maintain a secure LEEDS portal to be accessed by partners throughout project

Support

RIT will provide support to all registered portal users throughout the project. RIT will also support installation and troubleshooting of the application at MSB's premises at project conclusion. Final deployment of the server at MSB will serve as the master database. It is intended that RIT will maintain a mirror site, in order to study operational data in addition to serving as a remote database backup.

Support after the close of the project will be negotiated separately. RIT is willing to provide additional support in the form of portal hosting and data maintenance tasks in exchange for understanding MSB's requirements for ship life-cycle support. Any customization specific to the MSB implementation after the close of this project will require separate funding.

Project Deliverables

Task 1: Program Management

1.1 Provide regular progress reports
- Bi-weekly workgroup minutes/action items
- Monthly progress report to ONR

1.2 In-progress review
- Power point presentation
- LEEDS portal walk-thru

1.3 Final project review
- Power point project summary
- Final LEEDS portal walk-thru

Task 2: Provisional Documentation Population

2.1 Setup LEEDS portal
- LEEDS portal accessible from Internet
- Procedure flow for granting access and adding data to portal
- Getting started user guide

2.2 Populate LEEDS DB
- List of suggested portal data requirements
- Populated hierarchy of ship systems
- Populated portal containing data from content providers

2.3 Augment data
- generate data if not available, as warranted
- Ship schematics linked to ship systems hierarchy in portal

Task 3: Decision Tool Expansion

3.1 Decision support research
- Requirements specification
- Functional specification

3.2 Methods and algorithm development
- User reports defined

3.3 Software tools development
- Prototype mock-ups of proposed features
- Features implemented within portal; populated for select system

Task 4: Portal Transfer

4.1 Provide training workshop for MSB
- PowerPoint slides

4.2 Provide project documentation
- Server requirements for hosting LEEDS portal
- Server installation instructions
- User help utility/files

4.3 Deliver RIT-generated web/sql files
- Server installation package (populated with ship data)

Project Organization

- RIT Program Manager: Michael Thurston
- RIT Project Manager: Jeff Heintz
- ONR Project Sponsor: Paul Rispin
- MSB Project Manager: Lew Madden
- Additional Workgroup members: Sandy Zartman (MSB), Vern Edwards (ASD), Dan Sheridan (ONR), Brad Sworts (MSB), Michael Weller (MSB)

Communication Plan

The RIT primary point of contact for project information is Jeff Heintz, available at 585-475-6359 jphasp@rit.edu; Secondary point of contact is Mike Thurston at 585-475-6550 mgtasp@rit.edu

The MSB primary point of contact is Lew Madden at 408-782-5023, ldma@charter.net; Secondary point of contact is Sandy Zartman at 907-745-1265, Sandy.Zartman@matsugov.us

The RIT PM will notify the MSB PM of progress via a bi-weekly meeting. This will be via workgroup teleconference or in person as suitable. The agenda will be as follows:

1. Progress update and measurement against plan
2. Review of Action Items/ Issues Log
3. Any Other Business

Project updates will be supplied to the Project Sponsor by RIT during regular monthly progress reports.

Timely delivery and review of monthly progress reports and deliverables will be the responsibility of the Project Managers.

Lew Madden is responsible for timely sign off of project deliverables.

Assumptions

- MSB can provide adequate data necessary for RIT to populate the LEEDS portal
- Once data population has begun, MSB will notify RIT about significant design changes necessitating updates to data already entered in the portal.
- RIT is allowed sufficient time with potential users to gather requirements and solicit feedback for prototype decision tools

- In the event of deploying the server applications at MSB's premises, the hardware & base software (platform) on which the application is to be deployed is a clone of the RIT hardware/base software (platform)

Project Plan

A full project plan is located in \\Polaris78\dod_projects\Projects\E-Craft\ProjectManagement\ (available on request)

Risk & Issue Log

Located in \\Polaris78\dod_projects\Projects\E-Craft\ProjectManagement\RiskLog\ (available on request)

Sign Off

RIT (Program Manager or PM): _____ Date: _____

ONR Sponsor: _____ Date: _____

MSB PM: _____ Date: _____

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MV Susitna – LEEDS Portal Implementation

Application Discovery

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Version Control

Version	Date	Author	Comments
0.1	24 May 07	Jeff Heintz	First Draft
0.2	02 July 07	Jeff Heintz	Added 2.3, "Data Interoperability" scope

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1 Overview

This document summarises the outcome of the Application discovery process that was carried out as part of the analysis performed by Rochester Institute of Technology, absent of customer-input. The findings here form the starting point for the more detailed requirements and functional analysis phases of the project. They do not constitute a definition of the scope of the project.

2 Summary of Findings

It is the intent of this project to carry out interviews with stakeholders and representatives from MSB that will be managing the MV Susitna ferry. The purpose of these interviews will be to identify the work processes and tools the organization plans to employ for ship operations and maintenance, and identify potential challenges and obstacles they will face with ship life-cycle support. The purpose of this project will be to attempt to create software tools that will allow MSB to effectively manage these life-cycle support challenges.

In the absence of direct customer input, it is the opinion of RIT that MSB will need assistance in the areas of Reliability Centered Maintenance and Economic Decision Support. It is not the intent of RIT to develop a maintenance management system as there exist software applications that effectively provide this function.

2.1 Reliability Centered Maintenance (RCM)

RCM is a systematic process of preserving a system's function by prescribing preventative maintenance (PM) tasks, as opposed to implementing a strictly scheduled and costly equipment maintenance program. Utilizing the FMEA process already a part of LEEDS®, software tools would be developed in order to lead the RCM process in order to define the failure management policy that would prescribe what should be done, and when, to predict or prevent each functional failure. The results of the RCM solution would serve as input to the configuration of the ship's preventative maintenance management system.

Scope:

- Replicate MS Access-based RCM software tool in LEEDS
- Modify process to resemble Reliability Centered Design Analysis
- Enhance tie-in to CBM strategy

Benefits:

- Is necessary for determining CBM strategies for ship, very useful to MSB
- Is a good fit for LEEDS tool development,

Risks:

- Availability of CIMS' RCM-facilitators is unknown
- This will not be a traditional RCM exercise (it will more closely resemble a reliability centered-design analysis):
    - Availability of data to fuel RCM process before ship launch is unknown
    - Availability of SME's, operators and maintainers to participate in RCM is unknown
- RCM analysis (exploratory and detailed) scope is large and will likely rely on being funded outside of the ONR contracts; will rely on ONR grant or other unknown source.

2.2 Economic Decision Support

Building upon economic/cost analysis algorithms already utilized LEEDS®, additional enhancements will be made to provide meaningful evaluation methods for guiding equipment investment decisions. Potential enhancements include refinement of optimization algorithms and inclusion of methods for adjusting costs to reflect time-value of money, such as net present value.

2.3 Data Interoperability

The greatest concern MSB has expressed is the ability for future migration of data from the proprietary LEEDS database to another proprietary maintenance management software. In order to mitigate the risk of the data being non-transferable, research and development will be conducted to transform the LEEDS database schema or build an external software interface that conforms to industry standards or suggested guidelines for areas such as: configuration management, unique identification, and interactive electronic technical publications.

3 Application Choice

Final application choice cannot be made without customer input. However, progress can be made developing the aforementioned tools if the workgroup agrees there would be resulting benefits. Phone discussion with the MSB workgroup lead should be held as soon as possible to discuss these potential tools and to discuss the context of the expected ship operations and maintenance workflows.

4 Sign Off

RIT (Program Manager or PM): _____ Date: _____

ONR Sponsor: _____ Date: _____

MSB PM: _____ Date: _____

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MV Susitna LEEDS® Portal – Getting Started

Computer requirements:

- Have an Internet connection
- Microsoft Internet Explorer 5.0, or greater
- Monitor with a resolution at least 1024x768 ppi

Logging-In:

1. **Install the client-side certificate**. You should have received a PFX file and installation password. Install the certificate by double-clicking on the file and by following the Certificate Import Wizard instructions (leave all settings at their default values). You should be notified if the certificate was installed correctly.
2. **Navigate to the portal homepage** at https://leeds.cims.rit.edu/susitna using Microsoft's IE browser. You will be prompted to choose a digital certificate. Select the certificate installed in the previous step.
3. **Enter your username and password.** You should have received your username and password with your account notification. If logging in for the first time, be sure to change your password.
4. **Select >*Enter Database*** from the splash screen to view ship data.

Site use:

Navigation within the portal is achieved through the left and top menus. Special functions are available from the pull-down menu in the upper-left corner of the screen. For more information on using the portal refer to the *LEEDS Help* utility accessible from the *Help* pull-down menu.

Your ability to view and modify data within the portal is dependent on the group privileges to which your account has been assigned. An *Update Page* button will appear at the bottom of the screen if you are allowed to modify data within the portal. Notify LEEDS support from the Help pull-down menu if you If you would like to request additional privileges.

To improve security, the portal will automatically logout after 20 minutes of inactivity.

Common Problems:

- If you are returned a web page with the message "*The page must be viewed over a secure channel*", make sure to retype the URL using "https://", not "http://".
- If you are returned a web page with the message "*The page requires a client certificate*", make sure to install client-side certificate by running the PFX installation file. If the certificate has already been installed, verify you are using the appropriate Internet browser – the portal requires the use of Microsoft Internet Explorer, version 5.0 or greater.
- If the system does not accept your username and password, check to make sure 'Caps Lock' is not on - password is case-sensitive.

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- If you require additional assistance, you may contact the LEEDS administrator at mailto:LeedsSupport@reman.rit.edu, or use the LEEDS Help utility found under the Help topic from the top pull-down menu within the LEEDS application.

Terms of use of this site are in accordance with guidelines set forth in Proprietary Information Exchange Agreements executed with Matanuska-Susitna Borough.

For further inquiries regarding LEEDS, please contact Jeff Heintz by email at jphasp@rit.edu or by phone: (585) 475-6359, weekdays between the hours of 8-5 EST.

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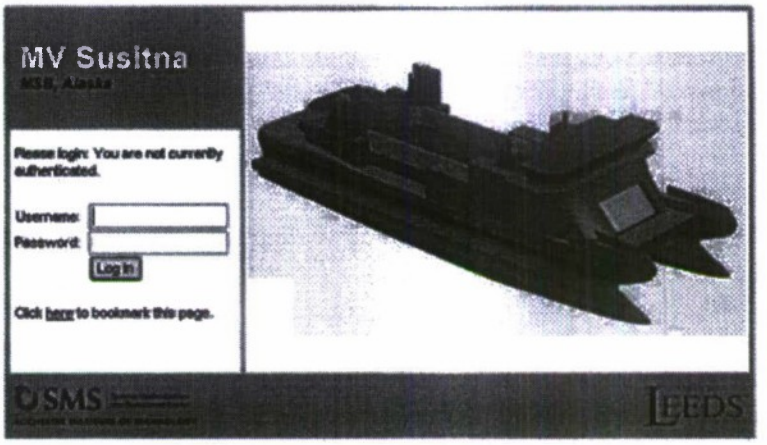
MV Susitna LEEDS® Portal – Requesting Access

What it is:
Originally developed by Rochester Institute of Technology (RIT), under grant from the Office of Naval Research, to aid in equipment remanufacturing assessments, the LEEDS portal is a repository of ship information.



LEEDS provides documentation capabilities and engineering decision support during design and throughout the life-cycle. LEEDS allows distributed users to query equipment information including configuration, specifications, drawings, manuals, costs, design analyses, condition/health and other information valuable to operators, maintainers and engineers. Unlike other engineering document management systems, LEEDS has been designed to leverage data contained within its repository to assist with equipment life-cycle support such as maintenance and EOL disposition decisions.

The MV Susitna LEEDS portal is accessible via the Internet, by approved users only.

To request access:
Access to the LEEDS website is granted on an individual basis. To request an account, please send the following information to:

Sandy Scepurek Port MacKenzie, MSB mailto:Sandy.Scepurek@matsugov.us	• Your name • Company name • Phone number • Email Address • Postal Address

After approval by MSB, you will receive your account information and further instructions for use of the website via email.

For further inquiries regarding LEEDS, please contact Jeff Heintz by email at jphasp@rit.edu or by phone: (585) 475-6359, weekdays between the hours of 8-5 EST.

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Susitna LEEDS Portal Security

Physical Security

Web and SQL servers are located in dedicated server room with restricted access to system administrators. Room is under 24-hour video surveillance and is alarmed after-hours. Room is accessed via swipe-card and keypad.

Server Security

Web and SQL servers are kept up to date with automatic virus protection and security patches.

Site Authentication

Authentication is a two-step process. First, clients authenticate themselves to the web server with a digital certificate. This certificate is created and distributed by a RIT certificate authority and must be installed on every machine used to access the website. Clients attempting to access the website without a certificate will be prevented from accessing the login page.

Second, every user must login with a valid user name and password. Passwords must contain at least 6 characters and are editable by user. The LEEDS administrator administrates accounts. Users can change their password. A usage log tracks user session log-in and log-out activity.

Encryption

128-bit SSL encryption is enforced for all data between web server and client. Cookies are used to track user and group permissions and are stored utilizing native .NET encryption.

Data Access

Once logged-in to LEEDS, access to information is based upon group permissions. Every user is assigned to a group, which contain one or more users. Permissions for individual web pages are set for the top three tiers of the equipment hierarchy, whereas permissions for subsequent lower levels are inherited. A user's data access permissions are defined by one of three states: read-only, modify, or hide. Permissions are managed through an administrators' interface.

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System Requirements for LEEDS F Hosting

Overview

LEEDS is a web based application for storing engineering data on a platform, variants and individual vehicles. It uses a database to store all the data and all user interactions with the data set is through the LEEDS web pages. LEEDS is built with Microsoft (MS) technologies, using MS SQL Server 2005 for the database, MS Internet Information Server (IIS) for serving the application. LEEDS application is built using MS ASP.NET 2.0 technology.

Hardware

A minimum hardware requirement is dependent on the number of simultaneous users expected to use the system and if the server is busy with other applications. LEEDS does not need a dedicated server and can be installed on another IIS/SQL application server.

For a small group of users, 10 to 15 total users, an older server of 2GHz dual processor with 2G RAM would provide acceptable performance. For more users or for hosting LEEDS on a server that is used for other applications a newer server with 3GHz dual processor and at least 2G RAM would be recommended. RIT's current LEEDS server is a dual processor 2.8 GHz machine with 4G RAM and a RAID 5 hard drive system.

An example system from Dell would be a PowerEdge 1950, with dual processors of Intel Xeon 5130s, 4G RAM and 2 SATA 80G hard drives in RAID 0. This system is about **$4600** without a tape backup system.

For hard drive space requirements LEEDS requires about 3G for IIS and SQL files. Daily backups of the SQL server are recommended and those could consume 1.5 to 2G per backup.

LEEDS uses a 3rd party hardware key installed on the server for license management. RIT will provide the hardware key which uses a USB port and a driver installer.

Software

LEEDS is designed to run using Windows 2003 Server with IIS enabled and .Net 2.0 installed. Additionally Microsoft's SQL Server 2005 Standard Edition required. SQL Server is the only one with an additional cost for licensing.

SQL Server is licensed in 2 different methods, per processor at **$5250**/processor or by a program license and a per client seat. The basic package is **$1593** with 5 client licenses plus an additional **$220** per additional client. Price from Provantage.com and is a commercial license price. Matanuska-Susitna might be eligible for state pricing discount.

Scott Nichols
Sr. Staff Engineer
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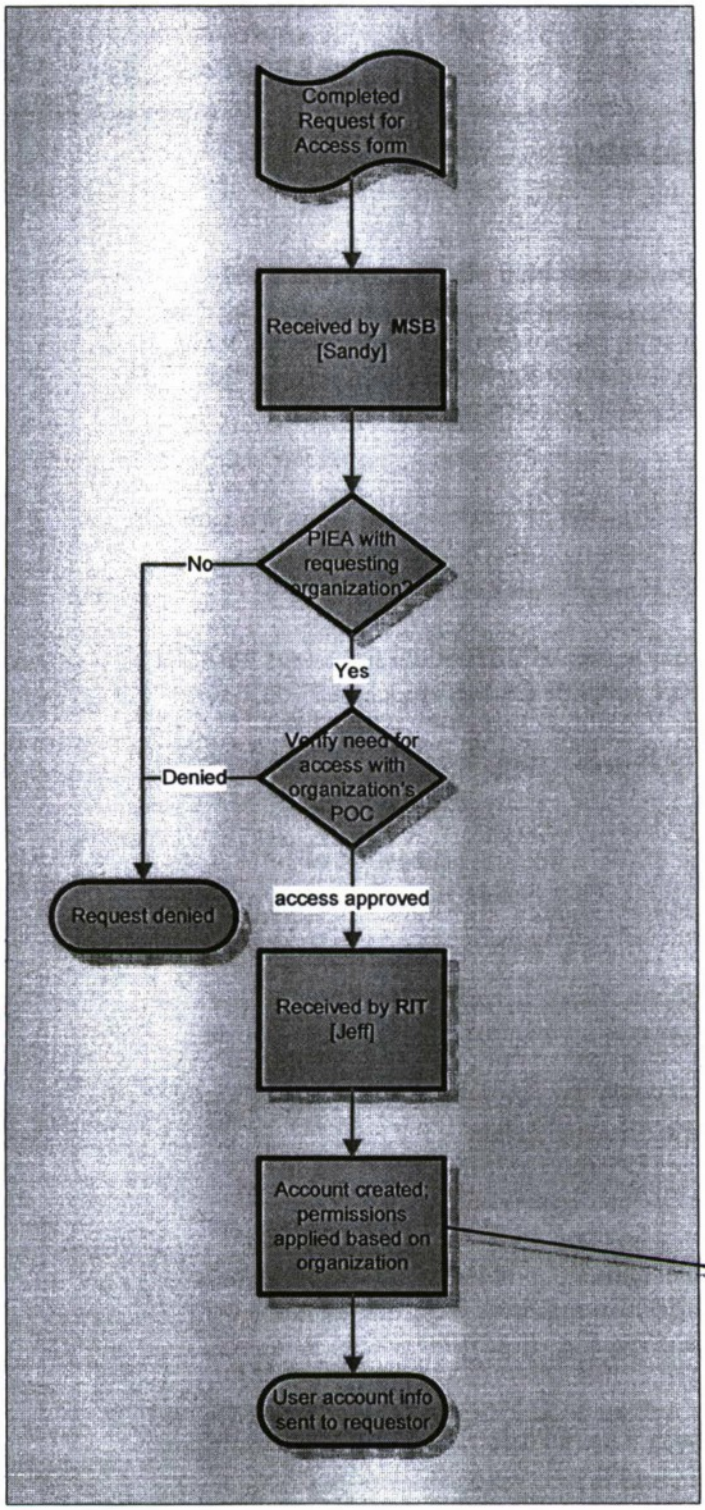
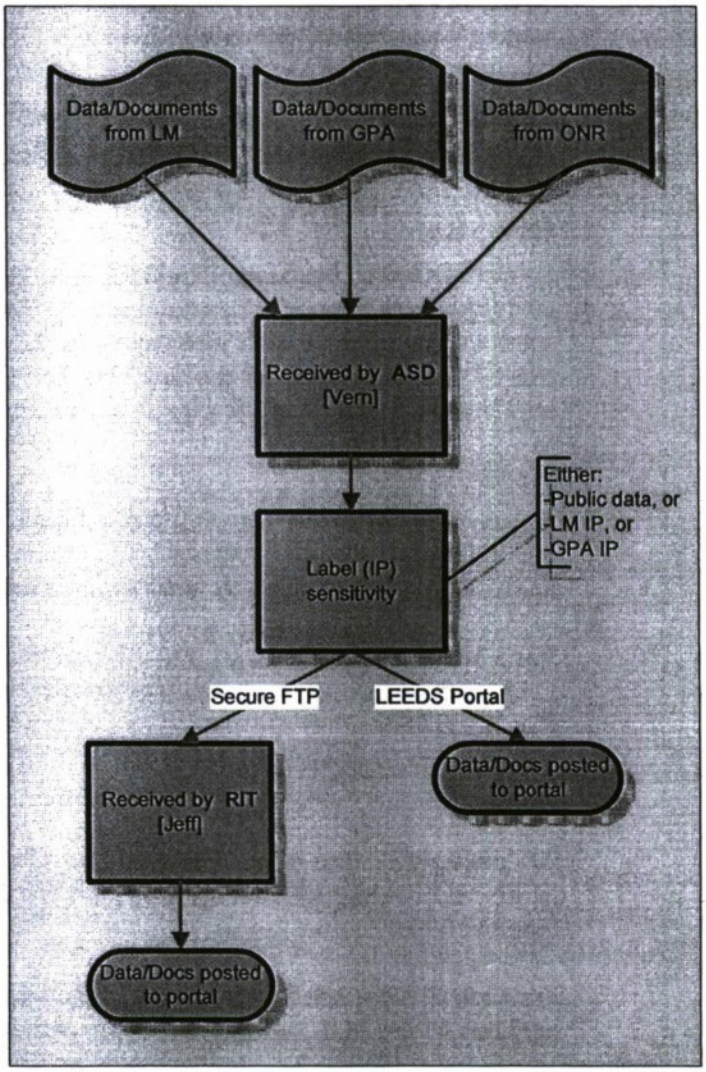
11/6/06

Adding a User to Portal



Posting Data to Portal



GROUP	PERMISSIONS
Lockheed Martin	Public & L-M IP only
GPA	Public & GPA IP only
MSB	All data/docs; admin?
ONR	All data/docs?
ASD	All data/docs?
RIT	All data/docs; admin

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LEEDS Implementation for E-Craft

RIT Working Concept Document for LEEDS Application to E-Craft
December 7, 2009

Vision

To perform predictive analysis on data from one or more ship systems and correlate operational characteristics of the data to maintenance records.

Based on the signal lists that have been provided, and feedback from ONR and MSB, the following systems are suggested as candidate systems for monitoring (in rough priority order):

- Gearboxes
- Engines
- Power Generation (Ship Service Generators)
- Water Jets and Thrusters
- Power Storage (DC Power)

MSB noted that gearboxes are a critical ship maintenance item on high speed ferries and that the current sensors only provide oil temperature. There was some discussion around means of implementing a ***gearbox vibration*** monitoring system. There are some challenges with respect to development and deployment of gearbox vibration monitoring technologies that will need further discussion.

MSB also noted that they thought that there was additional value in collecting/trending the data coming from the Carderock ***hull stress monitoring*** system. RIT believes that interpretation of the hull stress data is a significant research endeavor. In addition, there was discussion about monitoring the ship's lifting system. However, from the initial signal analysis, it seems that there is limited data from this system that could be used for analysis. This should be revisited – to cross reference data that may be available from the hydraulic system.

With respect to DC Power storage, MSB noted that they already have voltage monitoring capability. RIT has previously developed vehicle monitoring algorithms that take into account battery voltage and current to assess battery health. Currently there is not a plan to monitor DC currents on the ship. RIT recommends that we continue to include this as a monitored system – there may be some features from particular

operational scenarios that can provide additional insight into the charge and health state of the batteries.

Additional Points that were raised in RIT, MSB, ONR discussion:

Relative to previous sets of signal lists that were passed to RIT:

- The "I/O List" are signals that were not on the Serial Modbus and not available from the MTU engine monitoring system. These signals were added to the CAN bus by expansion (PIM) and will be available from the MCS5.
- All of the signals on the Serial List are also available from the MCS5.

The ABS Fleet Management System will be at port, not on the ship. There may be a remote copy of the DB that might be carried on the ship on a laptop. The system that RIT envisions will need periodic access to the maintenance histories stored within the ABS system.

Further, MSB noted that space on the ship is very limited and that there may not be room to add an additional computer to host the LEEDS system. There are several different architectural options for deploying a system to the E-craft – one option may be the use of a small embedded system on-board the ship that collects data from the MCS5, and communicates it to a LEEDS server that is collocated with the ABS system in port. It may also be possible, ultimately, to run the RIT data collection software on an existing computer on the ship.

MSB asked about coupling the LEEDS and ABS databases. It may be possible to use a single DB server, or to integrate more fully long term, however this may be beyond the current project scope to do in the short term.

With respect to the specific maintenance tasks that are planned for the ship, this effort has not yet been completed. It is anticipated that most of this information – at least the scheduled tasks – will come from the equipment manual recommendations. Not much thought has been given yet to condition based maintenance.

Assumptions

We can access the data from the MTU engine monitoring system, the Modbus, and the additional added signals (I/O List) via the MCS5 using the NetDDE interface, and that performance of this task will not impact the MCS5.

Maintenance data from the ABS NS5 Fleet Management System is accessible via a suitable interface.

Space (or a host computer) for the MCS5 data collection interface can be identified, and the LEEDS server will have periodic updates from the ABS maintenance system.

Short Term Open Issues

MSB has provided detailed schematics and design documents for the monitoring system, however schematics for ship systems (electrical - AC and DC, mechanical power transmission, hydraulic, etc.) will be needed going forward. RIT would like to get copies of OEM and maintenance task lists (as those are defined). This information will only be needed for those systems specifically to be studied.

A decision needs to be made with respect to retrofitting additional monitoring capability to the gearboxes. In comparing the MTU Ship Automation System M3M/003110167/030907/02 document to the various signal lists, we are not 100% clear about what gearbox signals are already available. However, vibration monitoring is not an existing system capability and would require added hardware and software. Using a PIM to link into the existing CAN bus is one option that could be explored.

Longer Term Open Issues

Arrive at a deployment architecture concept (hardware and software).

Identify contact for discussions regarding data structures or interfaces for reading ABS maintenance data.